REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 1-16 are pending.

Applicants request acknowledgement of the Eyuboglu reference cited in the IDS of December 12, 2005. It appears this reference was overlooked in the papers attached to the Official Action of March 13, 2006.

In the Official Action, Claims 1 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell et al ("Diversity Considerations for MC-CDMA Systems and Mobile Communications", IEEE, 1996, pp. 131-135, hereinafter Schnell) in view of Chun et al. (U.S. Patent No. 6,798,758, hereinafter Chun) and Ramberg et al. (U.S. Patent Publication No. 2001/0050948. hereinafter Ramberg); Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg and Dunn et al. (U.S. Patent No. 4,761,796, hereinafter Dunn); Claims 3-5, 13 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg and Brunel et al. ("Euclidean Lattice Decoding for Joint Detection in CDMA Systems", IEEE, 1999, p. 129. hereinafter Brunel); Claims 6-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg and Viterbo et al. ("A Universal Lattice Code Decoder for Fading Channels", IEEE, 1999, pp. 1639-1642, hereinafter Viterbo); Claims 8-9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg and Lupas et al. ("Linear Multi-User Detectors for Synchronous Code-Division Multiple-Access Channels", IEEE, 1989, pp. 123-136. hereinafter Lupas); Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg, and Adoul et al. ("Nearest Neighbor Algorithm for Spherical Codes from the Leech Lattice", IEEE, 1998, pp. 1188-1202, hereinafter Adoul); Claim 11 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun,

Ramberg and Mottier (U.S. Patent Publication 2002/0072336); Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg, and Kanemoto et al. (U.S. Patent Publication No. 2003/0012269, hereinafter Kanemoto); and Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schnell, Chun, Ramberg, Mottier and Song et al. ("Subspace Blind Detection of a Synchronous CDMA Signals in Multipath Channels", IEEE, 1999, pp. 21-24, hereinafter Song).

Regarding the rejections of Claims 11 and 14, Applicants note that Mottier was filed on August 24, 2001. However, Applicant claims priority to French Patent Application FR 0017071, filed on December 20, 2000. Applicant files herewith a translation of Applicant's priority document. A statement regarding accuracy is forthcoming.

Similarly, Applicant notes that Kanemoto is a PCT application filed on January 25, 2001, which is after Applicant perfected priority date. In view of Applicant's perfected claim to priority, Applicant submits that the rejection of Claim 12 based upon Kanemoto is moot.

Briefly recapitulating, Claim 1 is directed to a method of detecting a plurality of symbols transmitted by or for a plurality of k users. Each symbol belongs to a modulation constellation and is the subject of a spectral spreading by means of a spreading sequence. The method includes a filtering step adapted for supplying a complex vector $(y(i), \tilde{y}(i))$ characteristic of the received signal. The complex vector is decomposed into a first vector $(y^R(i), \tilde{y}^R(i))$ and a second vector $(y^I(i), \tilde{y}^I(i))$. At least the closest neighbors of the first and second vectors are sought within a lattice of points (Λ, Ω) generated by the modulation constellations. The transmitted symbols are estimated from the components of the closest neighbors.

Schnell describes multicarrier CMDA (MC-CDMA) transmitter that uses binary data symbols which are multiplied bit-synchronously with a user specific spreading sequence.

The data modulated spreading sequences of all users are added chip-synchronously. After a serial to parallel conversion the components of the data modulated spreading sequences are interpreted as complex frequency values of the subcarriers. Various modulation schemes can be used resulting in complex-valued components of the data modulated spreading sequences. A transmission symbol s(t) is obtained by a OFDM operation. The OFDM operation includes an Inverse Discrete Fourier Transform followed by a parallel to serial conversion and low pass filtering. [1]

Schnell goes on to describe a MC-CDMA receiver in Figure 2. In the receiver, the received signal r(t) is sampled and the inverse OFDM operation is performed, i.e., serial to parallel conversion followed by a DFT. If a frequency interleaver is applied at the transfer site, a frequency deinterleaver has to be applied with the receiver before parallel to serial conversion. A received vector is passed to an equalization detection unit where an estimate of the transmit data symbol of user i is produced. On page 135, Schnell describes that each transmission vector leads to a noise-free receiving vector. The possible transmission pattern is deduced by minimizing the squared Euclidean distance between a received, noise-corrupted vector and the hypothetical noise-free receiving vector. [2]

As acknowledged in the Official Action, Schnell is silent about decomposing the complex vector into first and second vectors, and about the symbols belonging to a modulation constellation from which a search lattice is formed. The Official Action goes on to assert Chun as disclosing a spreading sequence comprising a first and second vector.

Chun describes that an acquisition of an initial code synchronization and a receiving system for a CDMA signal is realized by producing a complex digital signal having K components by sampling an analog signal derived from the received CDMA-modulated signal. Components of the complex digital signal are correlated with N code phases. The

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[1] Schnell, page 132, col. 1-2
[2] Schnell, page 132, co. 2

energies of these correlated values are examined in parallel to determine whether the ratio of the maximum energy within the block to the average energy in the block equals or exceeds a predetermined threshold. If so, this is a valid maximum, and a code synchronization is complete. If not, further components of the complex digital signal are correlated with another set of N code phases, and are examined in the same manner. Accordingly, reliable determination as to whether code synchronization has been achieved can be realized with minimal influence of channel distortion and a CDMA receive signal.[3]

Within one embodiment, Chun describes a vector signal 102 is received by a parallel complex accumulator 12. The N phase part and quadrature phase part of each component of the vector signal 102 are accumulated separately thereby outputting vector signal 103. Vector signal 103 is made up of N components, each of which is a complex signal as shown in equations 7 and 8 of Chun. The parallel energy detector 13 receives the vector signal 103 which is output by the parallel complex accumulator 12 and calculates an energy for each component in parallel to output the vector signal 104. Vector signal 104 has N components, each of which is an energy value of a corresponding component of vector signal 103 which is a real number. This is expressed in equations 9 and10.[4]

However, contrary to the Official Action Chun, does not disclose or suggest decomposing a complex vector into a first and second vector. Applicant first notes that the Official Action does not specify with precision which step of Chun is purportedly equivalent to Applicant's decomposing. Thus, Applicant is left to guess which specific step in the cited passage is in question. Applicant first notes that vector signal 103 is derived from vector signal 102 through an accumulation process. This accumulation process does not include a step of decomposing into first and second vectors as recited in Applicant's claims. That is, the N components of vector signal 103 are just that, components not first and second vectors.

[3] Chun, Abstract.
[4] Chun column 6, lines 29-56.

Similarly, the energy for each component described in the cited passage and represented by a vector signal 104 is also not a decomposition of a complex vector into first and second vectors. Thus, Applicant submits that Chun fails to cure the deficiencies of Schnell.

Furthermore, the Official Action is silent as to how the signal accumulation and energy calculation of Chun would be integrated with or within Schnell. More importantly, Applicant submits that substituting the signal accumulation and energy calculation of Chun for any component within Schnell, or adding the accumulation and energy calculation of Chun to the detection method of Schnell, would result in a non-operable system. As noted in MPEP § 2143.02, the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is not clear from the record how the accumulation and energy calculation of Chun could be incorporated into the Schnell device. Furthermore, even if such a modification were possible, the modification would require a substantial reconstruction or redesign of the elements of the Schnell device, and/or would change the basic principle of operation of the Schenll device. There is no evidence that a person of ordinary skill in the art would be motivated to perform such changes and redesign.[5] Furthermore, it is not clear from the record whether such modification would actually result in a operable system.

Finally, Chun fails to disclose or suggest symbols belonging to a modulation constellation from which a search lattice is formed.

Ramberg describes a receiver for use in a spread spectrum communication system that includes an acquisition system configured to detect a transmitted spread spectrum signal by simultaneously correlating multiple search phases of a reference spreading signal against an

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[5] See In re Ratti, 270 F.2d 810, 813, 123 USPQ 349, 352 (reversing an obviousness rejection where the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate.")

output from a receiver channel. The receiver also includes a demodulation system configured to recover data embedded in the spread spectrum signal by simultaneously correlating the spread spectrum signal with multiple possible data phases of the reference spreading signal over consecutive data periods. The receiver also includes a bank of correlating devices configured to use both in the acquisition system and in the demodulation system.[6]

Paragraph 23 of Ramberg describes Figure 1 in which a direct sequence spread spectrum system in which cyclic code shift keying (CCSK) is used to modulate digital data onto digital pseudo-noise (PN) spreading sequences. CCSK is a modulation technique in which circular phase shifts of a PN sequence are used to represent the possible constellation (or data) symbols. For example, a 63 chip PN sequence could support up to 63 different data symbols, each of which would be 63 chips in length. An M-CCSK constellation (or alphabet) is a group of M-CCSK data symbols each representing a unique combination of binary data bits, where M is an integer greater than 1.[7]

However, contrary to the implication found in the Official Action, the mere fact that circular phase shifts of a PN sequence are used to represent a possible constellation of symbols does not correspond to Applicant's claimed symbols belonging to a modulation constellation ***from which a search lattice is formed***. A word search of Ramberg reveals no reference to the word "lattice" or any synonym for the word "lattice" or any other engineering term that would correspond to lattice based searching.

MPEP §706.02(j) notes that to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when

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[6] Ramberg, Abstract.
[7] Ramberg, paragraph 23.

combined) must teach or suggest all the claim limitations. Also, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Without addressing the first two prongs of the test of obviousness, Applicants submit that the Official Action does not present a *prima facie* case of obviousness because Schnell, Chun and Ramberg each fail to disclose all the features of Applicants' claimed invention.

Accordingly, in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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